DOCUMENT RESUME

ED 328 458 SE 051 943

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TITLE Science Attitude Analysis of Dayton Public School Teachers in Science.
PUB DATE Feb 91
NOTE 40p.; Contains some small, light, and broken type which may not reproduce well.
PUB TYPE Reports - Research/Technical (143) -- Tests/Evaluation Instruments (160)

EDRS PRICE MF01/PC02 Plus Postage.
DESCRIPTORS Administrators; *Curriculum Development; *Elementary School Science; Elementary Secondary Education; Science and Society; Science Curriculum; Science Education; *Science Teachers; *Secondary School Science; Surveys; *Teacher Attitudes; Teaching Methods; Textbooks; Urban Education
IDENTIFIERS Dayton Public Schools OH

ABSTRACT

As a beginning point for the curriculum revision process of the Dayton Public Schools, the attitudes of teachers and administrators in that particular urban area were assessed. A 17-item instrument was developed for use in the assessment. The instrument was mailed to all Dayton elementary, middle, and high schools. The attitudes held by Dayton Public School teachers regarding science instruction as it is practiced in the district's elementary, middle, and high school classrooms and the aspects of science instruction viewed as important by teachers were assessed. An introduction, limitations, methods, analysis, and discussion are included. A copy of the staff survey is appended. (KR)

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SCIENCE ATTITUDE ANALYSIS OF DAYTON PUBLIC SCHOOL TEACHERS IN SCIENCE

Presented to the

Dayton Public Schools

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February, 1991

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ATTITUDE ANALYSIS
OF DAYTON PUBLIC SCHOOL TEACHERS
IN SCIENCE

Improving science education is a primary goal for the American educational system. Most of the recent reform thrusts of legislators and learned societies focus either directly or indirectly on the enhancement of science experiences for K-12 students. Some argue for more process approaches (Kyle, Bonnstetter, and Gadsden, 1988); others stress the need for hands-on experiences (Gavel, 1986) that will more fully develop the cognitive capacities of young children. The messages regarding the right approach are mixed and at times conflicting. The lack of agreement on what approach to use further complicates the opportunities for meaningful change.

Often forgotten in the process of bringing about change is the attitude disposition of those implementing programs. Teachers frequently are inserviced on new ideas and innovative approaches before those delivering the "treatment" have a clear sense of the needs and perceptions of the population being served. Therefore, as a beginning point for the curriculum revision process of the Dayton Public Schools, the researchers decided to assess the attitudes of the teachers in that particular urban context. By understanding the current

"state" of the staff, it would be possible to determine the next steps that should occur in order to effectively assess the types of changes in teacher behavior and student achievement that might be evidenced over time.

Relevant Literature

The research literature base regarding teacher attitudes toward science and science instruction is limited, particularly with respect to teachers who function in exclusively urban environments. The surveys that have been completed have focused either on program implementation efforts (See Epstein and Dauber, 1989) or on teacher assessments of particular science goal orientations (see McIntosh and Ziedler, 1988).

Program evaluation surveys have taken several forms. Some researchers have focused on particular curricular programs (e.g., SCIIS) to determine their relative effectiveness in achieving established goals (Kyle, Bonnstetter, and Gadsden, 1988; Shymansky, Kyle, and Alport, 1983). These assessments have investigated the types of changes that can occur in teachers' perceptions of science and, in some cases, how "new" programs (typically inquiry and process oriented) impact upon subsequent student attitudinal dispositions.

A second broadly defined set of studies examine teacher attitudes toward the goals of science education and/or problem orientations in science instruction (Gallagher and Yager, 1981; Renner and Yager, 1980; Yager, 1978; McIntosh and Ziedler, 1988; Berkheimer, 1984). These types of studies have attempted to determine whether and how the goals commonly associated with the science agenda of 1980s should be achieved or how major problem areas in the field of science education should be solved.

A review of the available literature, including the ERIC database, revealed no studies that examine inner city (urban) teachers' attitudes toward the nature and importance of the science curriculum. The purpose of this study is to fill that void. Two questions form the basis for this study:

1. What attitudes do the Dayton Public School teachers currently hold regarding science instruction as it is practiced in the district's elementary, middle, and high school classrooms?

2. What aspects of science instruction do teachers in the Dayton Public School District view as important and to what degree do teachers perceive that current practices of the district are efficacious in achieving those areas identified as important?

Information gathered through this attitude assessment is to be used as a basis for the curriculum revision process.

Limitations

Two limitations mitigate the potential significance of the study. First, the questionnaires were distributed by the district's administrators and subsequently collected by them. It is possible that some teachers were apprehensive about how the results would be used given the administrator's key role in distributing and collecting the forms. Teachers might have viewed the assessment as something for the administration and then adjusted their responses (positively or negatively) to accommodate that perception.

Second, the survey was distributed in only one urban district. The realities of the practices in the Dayton City Schools make the findings most applicable to that setting. Still, there is no reason to suspect that the practices of the Dayton Schools are unique for an urban setting. For this reason, the findings can be viewed as at the very least illustrative of what other researchers might find if other urban teacher populations were to be surveyed.

Methods

A 17 item instrument was developed for use in assessing the attitudes of the Dayton teachers regarding science

instruction (see Appendix A). The instrument was developed following a review of the selected literature and discussions with experts in the field of science education.

The instrument was mailed to all Dayton School principals in the elementary (N=41), middle (N=7), and high schools (N=5). Building administrators distributed the instruments to all teachers in May 1990 in their buildings (elementary grade level) or to those teachers who had responsibilities for science-related instruction (middle and high schools). Administrators also were asked to complete the questionnaire. A total of 523 teachers and administrators responded (495 teachers and 28 administrators). Approximately 780 questionnaires were distributed for a response rate of 67% percent.

The respondents were varied in terms of their teaching responsibilities and district experience. Twenty-four percent of the respondents had fewer than 8 years of school-based experience; 33% had more than 22 years experience. Eighty-five percent of the respondents worked at the elementary level; 4 percent were in middle schools; and 5 percent of the respondents worked at the high school level. Approximately five percent of the respondents were administrators.

Of those responding to the questionnaire, 31 percent had served previously on a curriculum revision committee; 63 percent had never had such an opportunity for involvement. Five percent had been asked to be involved but declined to

participate in previous curriculum development efforts. Of those responding 69 percent used the science graded course of study at least periodically as a guide to curriculum decision making. Only 16 percent indicated that they never referred to the district's course of study. Those who responded that they did not use the course of study indicated that the primary reasons for "non use" included the vagueness of the document, the lack of appropriate supplies, and the datedness of the document.

Eighty-three percent of the respondents were female; 17% were male. The racial composition of the sample was 59 percent white and 41 percent minority.

Analysis

The teachers were asked a series of questions that related to two categories of attitudinal items. The first categorical item was: "The following is a list of comments made about the science curriculum (K-12) in our schools. Considering what you personally believe about Dayton's science program, identify on a scale of strongly agree to strongly disagree (or don't know) your current perception regarding (the status of the district for) each statement." The statements are provided in Table I along with the percentage of teacher responses to each attitudinal description.

Teachers held relatively similar perceptions regarding several items on the questionnaire. A majority of the respondents agreed (combination of strongly agree and agree categories) that science is not properly emphasized in grades K-6 (66% of the respondents held this view); that teachers are not properly trained as undergraduates in various science areas (65%); that textbooks are the basis for most science instruction (66%); that teachers do not attempt to explore both how and why scientific phenomena are evidenced (59%); that teachers do include critical thinking skills when teaching science concepts (54%); that science concepts taught reflect a balance of the biology, earth, and physical science areas (59%); that science instruction is essentially teacher centered (62%); that students seem to enjoy science experiences (71%); and, that the curriculum stresses process as well as content skills (56%).

A majority of the teachers disagreed (combination of strongly disagree and disagree) with two items on the questionnaire. First, they did not agree that K-8 teachers have little interest in science teaching (51% held this view), and 51 percent disagreed that Dayton teachers are unaware of the philosophy, goals, and rationale of science instruction in the schools.

The second category of items related to how important the teachers viewed different aspects of science teaching and, if important, how effective the district was in achieving

established purposes. A summary of the teacher responses is provided in Table 2. Items identified as very important by at least 60 percent of the teachers included the ability of the teacher to teach the process of science (66% of the teachers identified the item as very important); the emphasis on hands-on activities by the teachers (81%); the ability of the teacher to guide students in analyzing and discussing the world of science (68%); an emphasis on both the how and why of science (63%); an emphasis on thinking skills in science (74%); the utilization of various teacher styles and teaching models (57%); the provision of appropriate staff development (60%); a sensitivity to environmental concerns (63%) and to energy and resource conservation (66%); the use of a wide variety of teaching styles and teaching models (62%); an emphasis on inquiry - oriented science (60%); and an emphasis on activities that are both teacher directed and student initiated (68%).

Areas in which at least 60 percent of the teachers perceived the district was not effective in achieving identified purposes (i.e., a rating of fair or poor) included the following: an emphasis on the history of science (76%); an ability to help students apply and use different forms of technology (71); an emphasis on social issues involved in the sciences (67%); an ability to help students use hypotheses and various scientific theories (71%); an emphasis on inquiry science (68%); an emphasis on the structure of science (67%);

the utilization of many hands-on experiences (71%); appropriate sequencing of content and skills (64%); an ability to help students design their own experiments (76%); the use of a variety of teacher styles and teaching models (64%); the involvement of the community (73%); an emphasis on strong scientific knowledge (67%); an ability to facilitate science instruction that is interdisciplinary (72%); the provision of staff development that stresses various instructional delivery approaches (82%); an emphasis on the process of science (67%); an emphasis on activities that are both teacher directed and student initiated (67%); a focus on lecture as the major form of instruction (65%); the provision of information on science careers (63%); an appropriate focus on significant science concepts, skills, and values (61%); an emphasis on helping students distinguish science fact and personal opinion (60%); an appreciation of scientific knowledge as tentative (61%); an ability to help students formulate generalizations about scientific phenomena (64%); the sequencing of scientific content and skills (64%); an emphasis on scientific thinking skills (64%); the provision of appropriate staff development to help teachers implement new curriculum (80%); and the ability of the curriculum to enhance student sensitivity to environmental issues (63%).

Discussion

Although there are some mixed messages in the results of the survey (e.g., the teachers perceive the extant curriculum as textbook oriented and teacher centered but they do believe critical thinking skills are taught), there are some clear indications regarding what is now occurring in the district and what should be evidenced in the future. Three of these will be highlighted below.

First, a significant percentage (73%) of the teachers perceived the current science curriculum as extremely textbook oriented. This item, along with the indication by teachers that hands-on experiences are not utilized by teachers (71% of the teachers held this view), suggests that teachers need exposure to new approaches that might be both possible and useful in an urban environment.

The fact that teachers are textbook centered is not surprising. Many teachers asserted that they received inadequate scientific training as undergraduates (65%) -- they may, as a consequence, stick with the adopted text out of necessity. Further, the difficulty in obtaining hands-on materials mitigates even further the desire to offer a hands-on approach. Many teachers have neither the resources nor the scientific background to "stray" from the textbook. The result is a form of conceptual dependency on the text and the text's treatment of salient ideas -- ideas that may or may not

be a part of the prescribed curriculum of the school district.

A natural outgrowth of this first problem, textbook centeredness, is a second problem relating to an inquiry approach to science teaching. Teachers who rely on texts tend not to engender in students a critical perspective on scientific inquiry. Science emerges for "textbook bound" teachers as something more content than process oriented. Many teachers (68%) indicated that the Dayton schools did not provide sufficient and appropriate stress on inquiry methods and that students did not receive enough work in developing and testing hypotheses.

An emphasis on inquiry skills takes time. Teachers have to set up meaningful problems that students can deal with and understand. Staff development is needed that offers to teachers the types of experiences necessary for them to engage in classroom-based curriculum making. Indeed 80 percent of the teachers indicated that the district did not provide the type of professional development they needed in science in order to be effective.

Finally, most teachers (71%) indicated that students <u>seem to enjoy</u> science experiences (hands on and conceptual activities) when they are provided. Such a finding is not surprising or anomalous. Students like to <u>do</u> things in school; they enjoy being active and exploring ideas. Science, by its very nature, provides more opportunities for active learner participation than is typically evidenced in other

school subjects. Students in science have opportunities to think through why things are true and how they occur. These emphases on the nature of causality and structure of ideas (even when framed in the language of a textbook) engenders in students a sense of exploration and thought.

The elusive objective for teachers seems to be how, given the incredible time and social control demands they confront, to structure meaningful activities that are consistent with their knowledge base, congruent with the realities of the school context, and possible given the limited resources and shifting expectations of the school district (i.e., what subject is of most worth?).

Recommendations

Based on the attitudes of the teachers and administrators, particularly relative to areas in which the district is viewed as both important and weak, the following recommendations are offered.

1. Staff Development (Inquiry orientation) - Teachers need more staff development experiences that enable them to see how to create opportunities for enhanced student critical thinking as part of science instruction.

2. Staff Development (Instructional Orientation) - Teachers indicate that their instructional skills need to be strengthened, particularly with regard to the use of

innovative teaching models. Instructional models such as concept attainment, concept formation, cooperative learning, mnemonics, and synectics are examples of innovative approaches that teachers might test and use. Such staff development should also include work on how to make science hands-on at all grade levels. Examples of potential hands-on approaches (for example, the Mesa Arizona unit materials) that emphasize observing, classifying, and hypothesizing skills are now available and should be tested in selected professional development schools.

3. Content Seminars - Content seminars are needed to expand the knowledge base of the elementary and middle teachers so that they possess a firmer and more comprehensive knowledge of salient scientific concepts. Seminars should be conducted in earth science, chemistry, physics, and biology.

4. Curriculum Reform - Changes in the curriculum are needed to ensure appropriate sequencing of science concepts. What is taught and when it is taught are fundamental issues that dictate, implicitly at least, what should be learned.

5. Technology Use - Students and teachers need to be exposed to a variety of technologies that can be used as part of science instruction. These technologies should include such things as interactive video as well as traditional software programs.

6. Materials Acquisition - The district needs to provide teachers with the requisite hands-on and laboratory supplies if the teachers are to effectively utilize active student learning experiences. Teachers want to provide more hands-on experiences but often lack the materials, time, and resources needed to provide students with appropriate opportunities for involvement.

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APPENDIX A

STAFF SURVEY

STAFF SURVEY
SCIENCE CURRICULUM
DAYTON PUBLIC SCHOOL DISTRICT

Circle the number next to the appropriate response for each item.

1. My job classification in the district is:

    1. Elementary Classroom Teacher
    2. Middle School Science Teacher
    3. High School Science Teacher
    4. Building Administrator
    5. Central Office Administrator

2. My years of experience in education:

    1. 1 - 3 years
    2. 4 - 8 years
    3. 9 - 15 years
    4. 16 - 21 years
    5. 22 or more years

3. Have you served as a member of a curriculum revision, graded course of study committee within the past five years?

    1. Yes
    2. No
    3. No, asked but declined

4. If you have never been asked to serve on a curriculum revision, graded course of study committee, would you like to serve?

    1. Yes
    2. No

If you have never served on a curriculum committee, skip to Item No. 8.

5. Indicate how you became involved in a curriculum revision committee.

   1. Volunteered
   2. Appointed
   3. Elected
   4. Do not remember
   5. Other (specify) _____

6. Evaluate the support provided by the central office in terms of curriculum documents (e.g., research data, issues, trends, State Department of Education and/or learned society guidelines) provided by the central office to assist in curriculum revision.

   1. Very useful
   2. Somewhat useful
   3. Not too useful
   4. Not useful at all

7. Do you feel the curriculum revision process used in the Dayton Schools is:

   1. Good, don't change it
   2. In need of minor changes
   3. In need of major changes

8. Do you feel faculty members have a significant role in the decision-making process regarding curriculum revision?

   1. Yes
   2. No

9. How often do you use Dayton's Science Graded Course of Study in planning and implementing science lessons for students?

   1. Very often (Skip to 11)
   2. Often (Skip to 11)
   3. Sometimes (Go to 10)
   4. Seldom (Go to 10)
   5. Never (Go to 10)

10. Since you responded sometimes to never in your use of the science graded course of study, please list three reasons why.

_____

_____

_____

11. Do you feel the science graded course of study is consistent with the standards or guidelines of the State Department of Education and/or national learned societies.

1. Yes (Skip to 13)
2. No (Go to 12)
3. Don't know (Skip to 13)

12. Since you responded in the negative, which standard(s) are not addressed in Dayton's Science Graded Course of Study?

_____

_____

_____

13. In your opinion, does the quality of science education in the Dayton schools measure up to the knowledge, skills and attitudes needed in our society?

1. Yes
2. No
3. Don't know

14. The following is a list of comments made about science curriculum (K-12) in our schools. Considering what you personally believe about Dayton's science program, identify if you strongly agree, agree, disagree, strongly disagree, or don't know concerning the following:

PROBE: Considering what you believe about Dayton's science curriculum, do you agree - disagree with the following comments?

	SA	A	D	SD	DK
1. Science is not properly emphasized in grades K-6	1	2	3	4	5
2. Teachers (K-8) are not properly trained as undergrads in the various science areas	1	2	3	4	5
3. Textbooks are the basis for most science instruction	1	2	3	4	5
4. Teachers explore "how" and "why" something happens when teaching science	1	2	3	4	5
5. Teachers use critical thinking skills in teaching science concepts	1	2	3	4	5
6. Science teaching is balanced among the biological, earth, & physical science areas	1	2	3	4	5
7. Teachers in K-8 have little interest in science teaching	1	2	3	4	5
8. Instruction is mainly teacher centered (e.g., lecture)	1	2	3	4	5
9. Inquiry methods are used throughout the science curriculum	1	2	3	4	5
10. Goals and objectives in science are limited to specific factual knowledge	1	2	3	4	5
11. Teachers are unaware of the philosophy, goals, and rationale of science	1	2	3	4	5

	SA	A	D	SD	DK
12. Teachers stress "absolute truth" when teaching science concepts . . .	1	2	3	4	5
13. The curriculum stresses the development of science process skills (e.g., observation, hyothesis testing, design of experiments)	1	2	3	4	5
14. Students seem to enjoy their science experiences	1	2	3	4	5

15. Now that you have shared your feelings about the present curriculum, you are asked to take the following list of ideas and assess:

(a.) <u>How important each is to you</u> and
(b.) <u>How effectively the science curriculum is achieving these ideas</u>.

(PROBE A) Considering the following ideas about science education, how important is each to you -- very important, somewhat important, not too important, or not important?

(PROBE B) In your opinion, how well is the science curriculum doing in achieving each idea -- excellent, good, fair, or poor?

	---15 a--- How Important?				---15 b--- How Are We Doing?			
	VI	SI	NTI	NI	E	G	F	P
THE SCIENCE CURRICULUM:								
1. **Teaches the process of science (i.e., using the scientific method - hypothesizing, recognizing variables). . .**	1	2	3	4	1	2	3	4
2. **Emphasizes that activities should be both teacher-directed and student-initiated. . . . . .**	1	2	3	4	1	2	3	4
3. **Contains a study of the history of science . . . . .**	1	2	3	4	1	2	3	4
4. **Guides students in analyzing and discussing the world of science around them. . . . .**	1	2	3	4	1	2	3	4

	VI	SI	NTI	NI	E	G	F	P
5. Requires the use of various forms of technology.	1	2	3	4	1	2	3	4
6. Provides a balance of exposure to biological, earth, & physical sciences.	1	2	3	4	1	2	3	4
7. Explores the "how" and "why" of science	1	2	3	4	1	2	3	4
8. Emphasizes societal issues involved in the sciences . .	1	2	3	4	1	2	3	4
9. Stresses lecture as a major form of instruction, with laboratories for verification	1	2	3	4	1	2	3	4
10. Emphasizes the application and use of technology. . . .	1	2	3	4	1	2	3	4
11. Provides for an awareness of careers associated with the sciences & technology. . . .	1	2	3	4	1	2	3	4
12. Focuses upon science concepts, skills, and values	1	2	3	4	1	2	3	4
13. Encourages students to use the major hypotheses and various theories of science.	1	2	3	4	1	2	3	4
14. Stresses the use of the inquiry process of science	1	2	3	4	1	2	3	4
15. Distinguishes between scientific evidence and personal opinion	1	2	3	4	1	2	3	4
16. Emphasizes that science knowledge is tentative and subject to change.	1	2	3	4	1	2	3	4
17. Helps students formulate generalizations about scientific phenomena	1	2	3	4	1	2	3	4
18. Emphasizes the structure (concepts & generalizations) of the various sciences. . .	1	2	3	4	1	2	3	4

	VI	SI	NTI	NI	E	G	F	P
19. Utilizes many hands-on experiences and activities for students	1	2	3	4	1	2	3	4
20. Sequences content and skills that are built upon one another articulation) K-12.	1	2	3	4	1	2	3	4
21. Permits students to design their own experiments. . . .	1	2	3	4	1	2	3	4
22. Stresses the use of thinking skills	1	2	3	4	1	2	3	4
23. Permits use of a wide variety of teacher styles and teaching models.	1	2	3	4	1	2	3	4
24. Involves the use of the community; (e.g., individuals, agencies, environment) . . .	1	2	3	4	1	2	3	4
25. Emphasizes a strong scientific knowledge (i.e., the teacher needs to know a lot of science to implement the curriculum)	1	2	3	4	1	2	3	4
26. Integrates the various sciences to facilitate an interdisciplinary approach	1	2	3	4	1	2	3	4
27. Provides staff development to enable teachers to implement the curriculum	1	2	3	4	1	2	3	4
28. Provides staff development that emphasizes relevant science curriculum concepts and skills	1	2	3	4	1	2	3	4
29. Provides staff development on various instructional delivery approaches.	1	2	3	4	1	2	3	4
30. Develops sensitivity to environmental concerns . . .	1	2	3	4	1	2	3	4
31. Develops sensitivity toward energy and resource conservation	1	2	3	4	1	2	3	4

	VI	SI	NTI	NI	E	G	F	P
32. Stresses scientific facts. .	1	2	3	4	1	2	3	4

16. In your opinion, should the community be involved in the development of school curriculum or should school curriculum be developed by school administrators and teachers?

    1. Community
    2. School administrators and teachers
    3. Teachers only
    4. Community and school staff

17. In your opinion, what is the biggest barrier to improving the science curriculum in the Dayton Public Schools?

_____

_____

_____

_____

_____

Please provide the following demographic information:

18. Sex of the person completing this survey:

    1. Male

    2. Female

19. Highest degree earned:

    1. Bachelors

    2. Masters

    3. Doctorate

20. Racial/ethnic background

    1. White/Anglo

    2. Black/African-American

    3. Oriental/Asian-American

    4. Hispanic/Latin American

    5. American Indian

21. Would you be willing to take an anonymous examination that measures your knowledge of science in the biological, physical, and earth science areas?

    1. Yes

    2. No

22. If you answered yes to Item 21, please complete the attached form.

INFORMATION FORM

This form is to be completed only if you are willing to complete the science knowledge examination. The test will be approximately one hour in duration and you will receive a $10.00 gift certificate to use at Books and Company book store if you participate.

NAME _____

ADDRESS _____

_____

PHONE (Home) _____

(Office) _____

GRADE YOU TEACH _____

Correspondence concerning the test will be made by:

Dr. Thomas J. Matczynski
326 Chaminade Hall
The University of Dayton
Dayton, OH 45469
229-3734

TABLE I

TEACHER ATTITUDES TOWARD DAYTON SCIENCE CURRICULUM

ITEM	N	STRONGLY AGREE	AGREE	DISAGREE	STRONGLY DISAGREE	UNDECIDED
1. Science is not properly emphasized in grade K-6	519 (18)*	24%**	42%	22%	3%	9%
2. Teachers K-8 are not properly trained as undergrads in the various science areas	515 (22)	25%	40%	21%	6%	8%
3. Textbooks are the basis for most science instruction.	514 (23)	27%	49%	13%	8%	3%
4. Teachers explore "how" and "why" something happens when teaching science	512 (25)	9%	50%	22%	7%	12%
5. Teachers use critical thinking skills in teaching science concepts	513 (24)	7%	47%	26%	8%	12%
6. Science teaching is balanced among the biological, earth, and physical science areas	516 (19)	8%	51%	20%	7%	14%
7. Teachers in K-8 have little interest in science teaching	517 (20)	8%	29%	37%	14%	12%
8. Instruction is mainly teacher centered (e.g., lecture)	511 (26)	12%	50%	25%	7%	6%
9. Inquiry methods are used throughout the science curriculum	509 (28)	3%	39%	34%	10%	14%
10. Goals and objectives in science are limited to specific factual knowledge	510 (27)	5%	51%	27%	4%	13%
11. Teachers are unaware of the philosophy, goals, and rationale of science	518 (21)	6%	34%	38%	11%	11%
12. Teachers stress "absolute truth" when teaching science concepts	517 (20)	2%	26%	38%	8%	26%

ITEM	N	SA	A	D	SD	U
13. The curriculum stresses the development of science process skills (e.g., observation, hypotheses testing, design of experiments	514 (23)	6%	50%	23%	9%	12%
14. Students seem to enjoy their science experiences	518 (21)	16%	55%	19%	4%	6%

* Indicates number of nonrespondents

* * All percentages have been rounded off to equal 100%

TABLE 2

RELATIVE IMPORTANCE AND ASSESSMENT
OF SUCCESS OF DISTRICT IN ACHIEVING
SCIENCE OBJECTIVES

ITEM	N	VERY IMPORTANT	SOMEWHAT IMPORTANT	NOT TOO IMPORTANT	NOT IMPORTANT	N	EXCELLENT	GOOD	FAIR	POOR
1. Teaches the process of science (i.e., using the scientific method-hypothesizing, recognizing variables)	507 (30)*	66%	30%	3%	1%	488 (49)*	4%	29%	50%	17%
2. Emphasizes that activities should be both teacher and student initiated	510 (27)	68%	29%	2%	1%	486 (51)	5%	28%	48%	19%
3. Contains a study of the history of science	500 (37)	24%	48%	23%	5%	475 (62)	1%	23%	48%	28%
4. Guides students in analyzing and discussing the world of science around them	509 (29)	68%	28%	3%	1%	483 (54)		39%	45%	12%
5. Requires the use of various forms of technology	499 (38)	45%	44%	9%	2%	475 (62)	2%	25%	51%	22%
6. Provides a balance of exposure to biological, earth, and physical sciences	500 (37)	59%	37%	3%	1%	478 (59)	5%	37%	46%	12%
7. Explores the "how and "why" of science	501 (36)	63%	34%	3%	0%	479 (58)	4%	37%	47%	12%

ITEM	N	VI	SI	NTI	NI	N	E	G	F	P
8. Emphasizes societal issues involved in the sciences	497 (40)	45%	45%	9%	1%	466 (71)	4%	29%	50%	17%
9. Stresses lecture as a major form of instruction, with laboratories for verification	496 (41)	19%	41%	31%	9%	462 (75)	7%	28%	45%	20%
10. Emphasizes the application and use of technology	490 (47)	42%	47%	10%	1%	470 (67)	3%	26%	50%	21%
11. Provides for an awareness of careers associated with the science and technology	500 (37)	51%	40%	7%	2%	475 (62)	6%	32%	45%	17%
12. Focuses upon science concepts, skills, and values	497 (40)	48%	47%	4%	1%	469 (68)	4%	35%	48%	13%
13. Encourages students to use the major hypotheses and various theories of science	496 (41)	49%	41%	9%	1%	467 (70)	4%	25%	51%	20%
14. Stresses the use of the inquiry process of science	500 (37)	60%	34%	5%	1%	473 (64)	4%	28%	50%	18%
15. Distinguishes between scientific evidence and personal opinion	500 (37)	54%	38%	6%	2%	471 (66)	7%	33%	49%	11%
16. Emphasizes that science knowledge is tentative and subject to change	500 (37)	53%	39%	7%	1%	475 (62)	5%	34%	48%	13%
17. Helps students formulate generalizations about scientific phenomena	495 (42)	44%	48%	7%	1%	474 (63)	4%	32%	51%	13%

ITEM		N	VI	SI	NTI	NI	N	E	G	F	P
18.	Emphasizes the structure (concepts and generalizations) of the various sciences	491 (46)	33%	51%	15%	1%	469 (68)	4%	29%	51%	16%
19.	Utilizes many hands-on experiences and activities for students	507 (30)	81%	17%	2%	0%	483 (54)	5%	24%	38%	33%
20.	Sequences content and skills that are built upon one another (articulation) K-12	495 (42)	58%	37%	4%	1%	469 (68)	6%	30%	46%	18%
21.	Permits students to design their own experiments	496 (39)	49%	38%	12%	1%	478 (59)	5%	19%	46%	30%
22.	Stresses the use of thinking skills	504 (33)	74%	22%	4%	0%	476 (61)	7%	30%	46%	17%
23.	Permits use of a wide variety of teacher styles and teaching models	505 (32)	62%	32%	5%	1%	481 (56)	7%	29%	45%	19%
24.	Involves the use of the community: (e.g., individuals, agencies, environment)	504 (33)	47%	40%	10%	3%	477 (60)	4%	23%	40%	33%
25.	Emphasis a strong scientific knowledge (i.e., the teacher needs to know a lot of science to implement the curriculum)	501 (36)	30%	47%	21%	2%	469 (68)	4%	29%	47%	20%
26.	Integrates the various sciences to facilitate an interdisciplinary approach	490 (47)	36%	49%	12%	3%	458 (79)	3%	25%	48%	24%

ITEM		N	V	SI	NTI	NI	N	E	G	F	P
27.	Provides staff development to enable teachers to implement the curriculum	502 (35)	60%	32%	7%	2%	479 (58)	4%	16%	38%	42%
28.	Provides staff development that emphasizes relevant science curriculum concepts and skills	496 (41)	55%	34%	9%	2%	479 (58)	4%	16%	40%	40%
29.	Provides staff development on various instructional delivery approaches	497 (40)	53%	36%	8%	3%	472 (65)	2%	16%	42%	40%
30.	Develops sensitivity to environmental concerns	499 (38)	63%	31%	5%	1%	479 (58)	5%	32%	44%	19%
31.	Develops sensitivity toward energy and resource conservation	502 (35)	66%	29%	4%	1%	482 (55)	3%	31%	48%	18%
32.	Stresses scientific facts	446 (89)	43%	48%	8%	1%	429 (108)	10%	42%	43%	5%

*Indicates number of nonrespondents

* * All percentages have been rounded off to equal 100%.